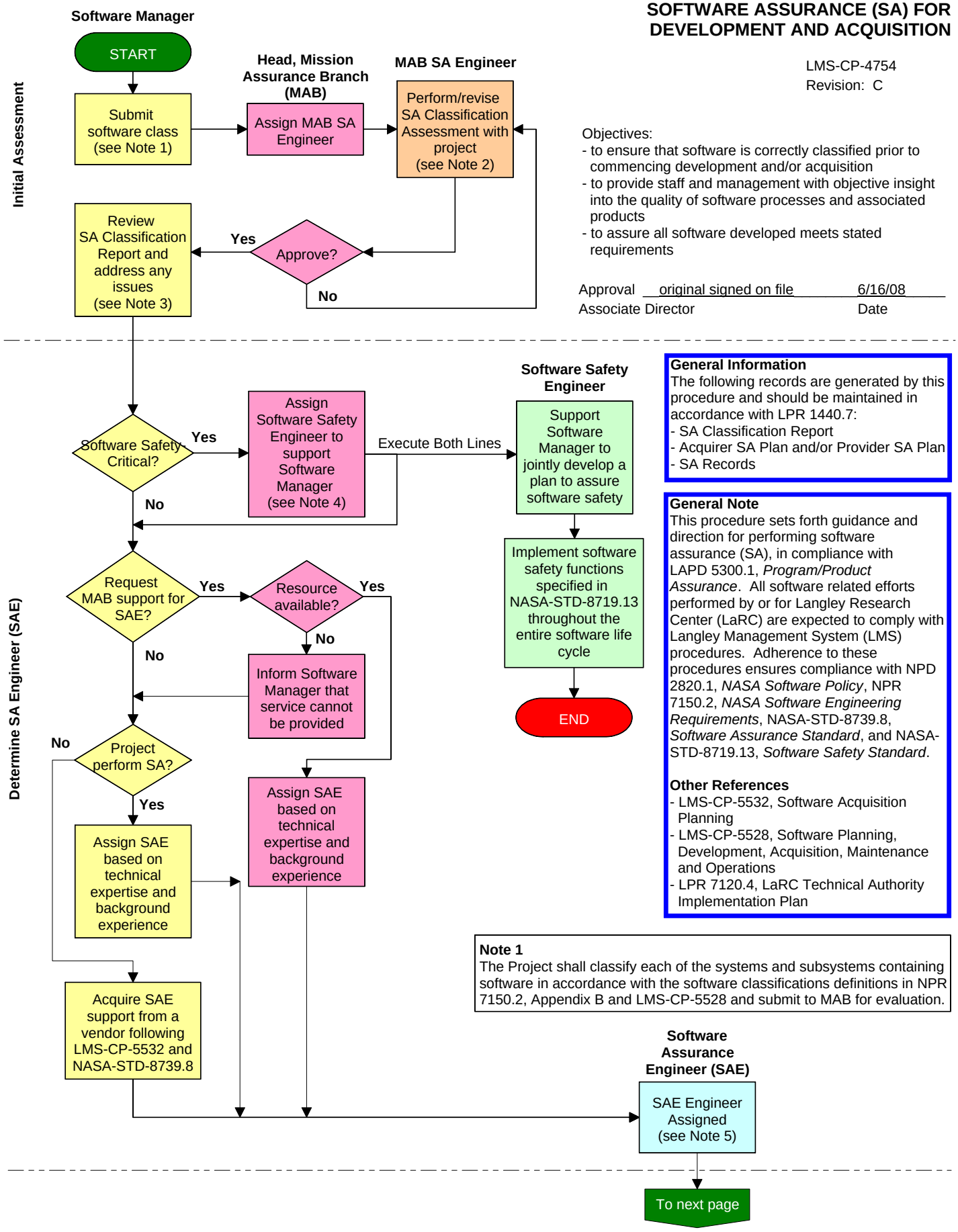
SOFTWARE ASSURANCE (SA) FOR DEVELOPMENT AND ACQUISITION

LMS-CP-4754
Revision: C

Objectives:
- to ensure that software is correctly classified prior to commencing development and/or acquisition
- to provide staff and management with objective insight into the quality of software processes and associated products
- to assure all software developed meets stated requirements

Approval original signed on file 6/16/08
Associate Director Date

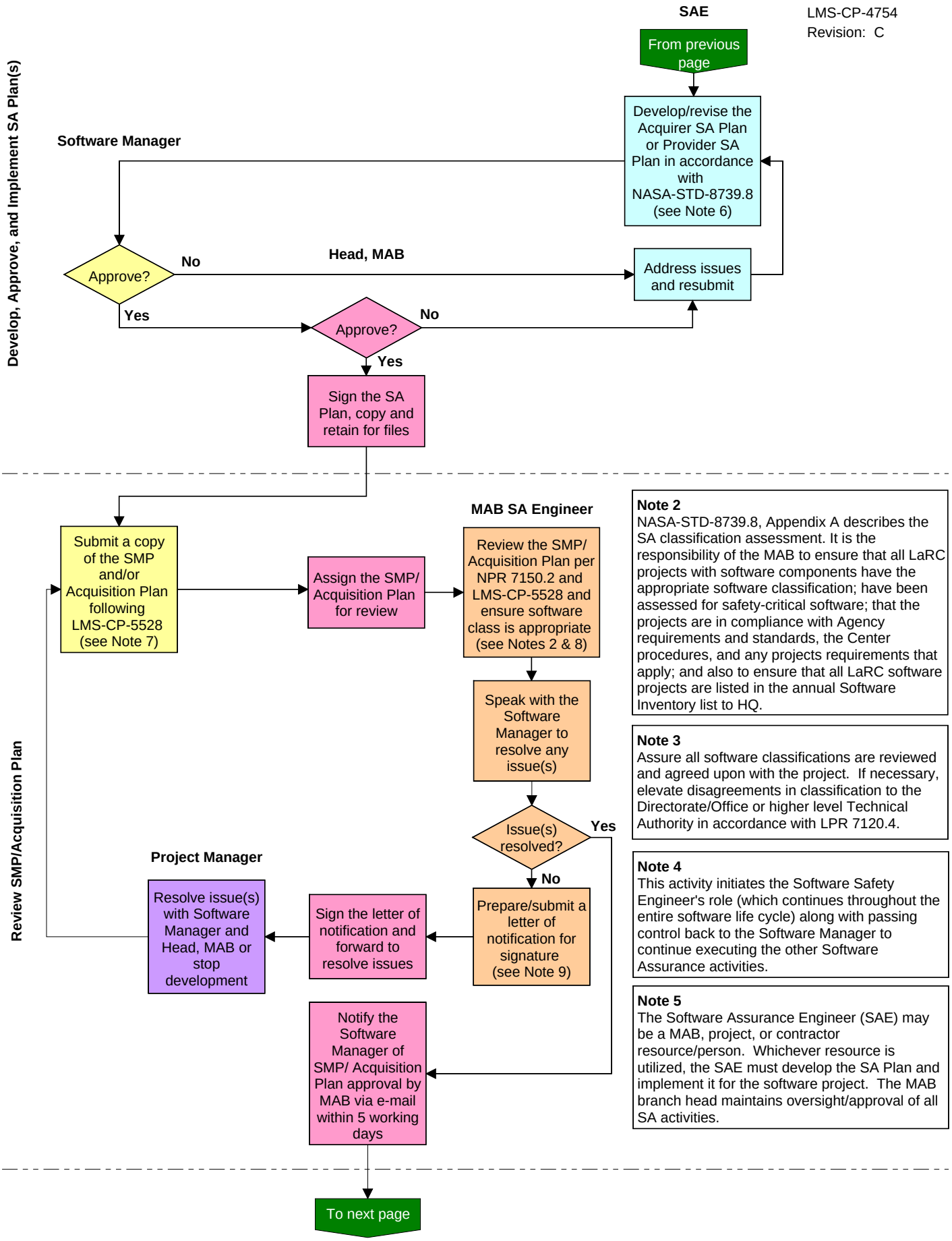


General Information
The following records are generated by this procedure and should be maintained in accordance with LPR 1440.7:
- SA Classification Report
- Acquirer SA Plan and/or Provider SA Plan
- SA Records

General Note
This procedure sets forth guidance and direction for performing software assurance (SA), in compliance with LAPD 5300.1, *Program/Product Assurance*. All software related efforts performed by or for Langley Research Center (LaRC) are expected to comply with Langley Management System (LMS) procedures. Adherence to these procedures ensures compliance with NPD 2820.1, *NASA Software Policy*, NPR 7150.2, *NASA Software Engineering Requirements*, NASA-STD-8739.8, *Software Assurance Standard*, and NASA-STD-8719.13, *Software Safety Standard*.

Other References
- LMS-CP-5532, Software Acquisition Planning
- LMS-CP-5528, Software Planning, Development, Acquisition, Maintenance and Operations
- LPR 7120.4, LaRC Technical Authority Implementation Plan

Note 1
The Project shall classify each of the systems and subsystems containing software in accordance with the software classifications definitions in NPR 7150.2, Appendix B and LMS-CP-5528 and submit to MAB for evaluation.

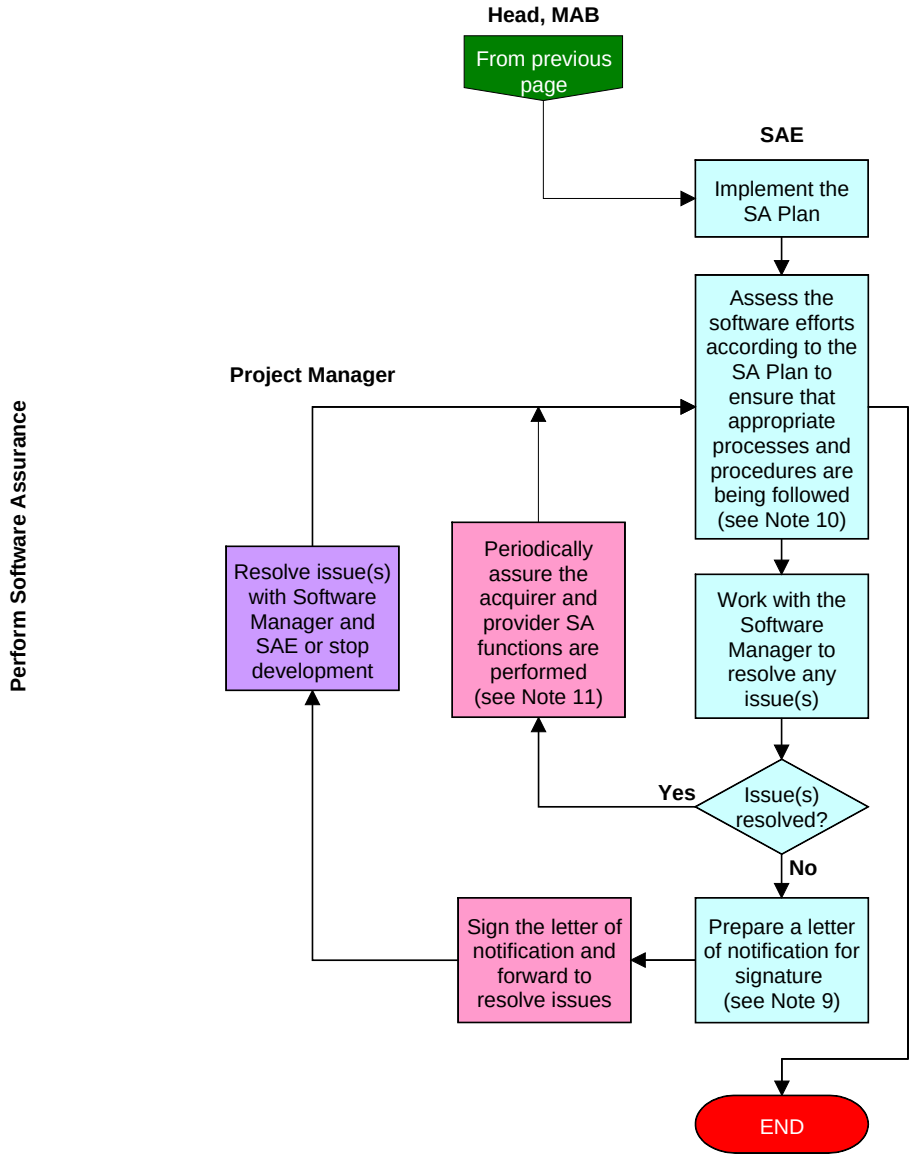


Note 2
NASA-STD-8739.8, Appendix A describes the SA classification assessment. It is the responsibility of the MAB to ensure that all LaRC projects with software components have the appropriate software classification; have been assessed for safety-critical software; that the projects are in compliance with Agency requirements and standards, the Center procedures, and any projects requirements that apply; and also to ensure that all LaRC software projects are listed in the annual Software Inventory list to HQ.

Note 3
Assure all software classifications are reviewed and agreed upon with the project. If necessary, elevate disagreements in classification to the Directorate/Office or higher level Technical Authority in accordance with LPR 7120.4.

Note 4
This activity initiates the Software Safety Engineer's role (which continues throughout the entire software life cycle) along with passing control back to the Software Manager to continue executing the other Software Assurance activities.

Note 5
The Software Assurance Engineer (SAE) may be a MAB, project, or contractor resource/person. Whichever resource is utilized, the SAE must develop the SA Plan and implement it for the software project. The MAB branch head maintains oversight/approval of all SA activities.



Note 6
Establish the appropriate Software Assurance Plan(s):
Acquirer SA Plan: For the entity who specifies the requirements and accepts the resulting software products
– usually NASA or an organization within the Agency.
Provider SA Plan: For the entities that design, develop, implement, test, operate, and maintain software products
– may be a contractor, a university, a separate organization within NASA, or within same organization as the acquirer.

Develop SA requirements with the project as the Software Management Plan (SMP) and/or the Acquisition Plan are being completed in accordance with LMS-CP-5528.

Note 7
For Class A and B software and any software deemed safety-critical, the Software Management Plan (SMP) and/or Acquisition Plan must be submitted to the Head of the MAB for approval prior to the start of development/acquisition, regardless of who is performing the SA activities.

Note 8
Using the requirements provided in NPR 7150.2 and LMS-CP-5528, review the SMP to ensure that the appropriate class is selected and the appropriate requirements according to that class are documented in the SMP and/or Acquisition Plan.

Note 9
Ensure copies of the written notification are sent to:
- Director, Safety and Mission Assurance Office
- LMS Management Representative
- Organizational Unit Manager of the Software Manager
- Project Manager
- Customer

The letter must contain the following information:
- The instruction to stop development by a certain date if the issue is not resolved
- The rationale for requesting re-evaluation
- The course of action that will resolve the dispute

Note 10
Appendix A, LaRC Software Assurance Checklist, provides a checklist which can be used as a quick reference guide.

Note 11
MAB will provide surveillance to assure that both the acquirer and provider SA functions are performed according to the SA plans.

Ensure the acquirer SA provides insight into whether the provider is adhering to approved SA, management, and development plans and procedures.

Ensure the acquirer SA provides oversight of the provider's management, assurance, and engineering processes.

MAB SA Engineers also serve as appraisers on CMMI based appraisals.

☒	#	Checklist Item	Comments
	1.	ACQUIRER OR PROVIDER?	
☐	a.	Are the SA actions supporting an acquirer (obtaining a product) or provider (developing a product)? This first item may be one of the hardest questions to answer. The following criteria are provided to help make the decision:	
		As an acquirer: - There is probably a contract or other Center involved - SA is being provided in an oversight/monitoring fashion - There are SA activities being performed by others that you are monitoring - You are not primarily responsible for performing SA on the developed products (i.e., SA is being performed by contractors, project personnel, or other Centers)	
		As a provider: - You have the primary responsibility for performing SA for the developed products - There probably isn't another SA office performing SA on the developed products	
	2.	MANAGEMENT:	
☐	a.	Does the SA management have sufficient independence from the development to provide objectivity in identifying and reporting noncompliance issues?	
☐	b.	Has a SA Engineer (SAE) been identified and assigned?	
☐	c.	Does the SAE have the required skills and training?	
☐	d.	Does the SAE have the responsibility and authority to perform SA?	
☐	e.	Does the SAE have the organizational freedom to permit objective software product and process evaluations?	
☐	f.	Is the process for addressing and escalating noncompliance issues, problems, and corrective actions defined?	
	3.	PLANNING:	
☐	a.	Has the SA Classification Assessment been accomplished?	
☐	b.	Has the SA Classification Report been reviewed with the Software Manager?	
☐	c.	Is the software effort safety-critical?	
☐	d.	Has the appropriate SA Plan been created and approved?	
☐	e.	Has the Software Management Plan (SMP) and/or Acquisition Plan been reviewed and approved by MAB?	
	4.	INITIAL SETUP:	
☐	a.	Has the SAE established a method for documenting, tracking, and reporting noncompliance issues, problems, action items, and corrective actions?	
☐	b.	Has the SAE established a method for collecting, reporting, and maintaining SA related metrics?	
	5.	PERFORMING:	
☐	a.	Is the SAE performing required actions for contract award (acquirer only)? - Initialization and pre-award actions - Post RFP and pre-award actions - Post award and pre-development actions	
☐	b.	Is the SAE performing required actions for product assurance? - Required plans are documented, adhere to standards, and are executed - Software requirements are defined, traceable, and analyzed - Software products and related documentation are evaluated - Documentation and changes account for impacts to the quality of the product - Software quality metrics are in place and used - Status and quality of software are presented at formal reviews - Problems with products are reported during reviews and meetings - Deliverable and designated products are properly configuration managed - Lower level testing results and software development folders are updated, audited, and/or reviewed for completeness - Software is verified as compliant with functional and performance requirements - Formal and acceptance testing is witnessed	

☒	#	Checklist Item	Comments
		- An acceptance audit is performed prior to delivery - All acceptance documentation is complete - Software products and changes are baseline managed during Operations	
☐	c.	Is the SAE performing required actions for process assurance? - Software life cycle processes adhere to the applicable plans - Problems that are found are documented, tracked, and resolved - Software engineering practices, development environment, test environment, and libraries adhere to applicable standards and procedures - Formal reviews and inspections are monitored and address quality issues - Management, engineering, and assurance processes are audited for compliance - Software quality metrics process is assessed for compliance - Assurance processes for off-the-shelf software are developed and followed - Acquirer facilities are prepared to receive and install the software - Acquisition lessons learned are recorded in the NASA lessons learned database - SA processes are in place for Operations - SA processes are in place for Maintenance - Appropriate licenses, simulators, models, and test suites are transferred - Appropriate metrics are transferred to the maintenance organization - A retirement plan is created, approved, and followed - Records are properly archived and/or disposed	
☐	d.	Is the SAE performing required actions for software safety? - If software is safety-critical, NASA-STD-8719.13 are implemented - System safety program, software development, and software assurance personnel are coordinating on required tasks - Any safety risks are identified and communicated - Periodic reviews and/or audits are conducted for compliance	
☐	e.	Is the SAE performing required actions for software reliability? - Fault tolerance and redundancy are specified, implemented, and verified - Reliability analyses and measurements, including trends and metric data, are provided to MA and project management - Defects found during reviews are collected and classified - Software quality metrics are documented, monitored, analyzed, and tracked - Trend analyses are performed and available	
☐	f.	Is SAE performing required actions for software verification and validation (V&V)? - V&V activities are occurring according to plans, policies, procedures, & standards - SAE is participating in formal and informal reviews - Software testing and demonstration results are witnessed or reviewed - Defect data is analyzed for software quality metrics - SA records showing participation are collected and maintained - Objective evidence of the software's readiness for operational release is provided	
☐	g.	Is SAE performing required actions for software independent V&V (IV&V)? - If IV&V is selected for the effort, required data and information is shared	
	6.	RISK MANAGEMENT:	
☐	a.	Has the SAE assessed the project's risk management process and Risk Management Plan?	
☐	b.	Is the SAE participating in project meetings and reporting any software risks?	
	7.	RECORDS AND STATUS REPORTING:	
☐	a.	Are SA records being created and maintained? (e.g., SA plan, SA classification report, assessment/evaluation reports, completed checklists, metrics, status reports, sign-offs, audits)	
☐	b.	Is the SAE providing regular status reports to project management and MAB?	